# Culture and Varieties of

# SPRING-SOWN RED OATS

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# CONTENTS



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# Culture and Varieties of Spring-Sown Red Oats[1]

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The production of spring-sown red oats in the United States has fluctuated considerably, but about 7 million acres of the spring oats sown in 1954 consisted of red oat varieties. This is 15 to 17 percent of the oat acreage of the United States. More hardy varieties of winter oats and disease-resistant white oats are replacing the spring-sown red oats in certain areas. Most of the white oat varieties, however, mature too late to be well adapted to the red oat region. New and better disease-resistant varieties now being developed are expected to restore the popularity of spring-sown red oats.

## AREAS WHERE ADAPTED

Spring-sown red oats are grown in an almost continuous belt from the Rocky Mountains to the Atlantic coast (fig. 1), comprising a transition zone between the fall-sown oat region to the South and the common white spring oat region to the North. California and Oregon also grow some oats of this type. In California they are largely fall-sown, since they survive the mild winters in that area. Oats have a high water requirement and are less well adapted to semiarid conditions than are wheat and barley.

## SOIL TYPES

Oats usually produce satisfactory yields on almost any well-drained soil that is reasonably high in fertility. Generally, loam soils are best suited to oats. Heavy, poorly drained clay soils, those soils subject to overflow, or soils too high in fertility are not well suited. Sandy soils often do not retain sufficient moisture for good crops of oats.

## ROTATIONS

Early seeding usually is essential to profitable production of any spring oat, and this is doubly important with spring-sown red oats. They should be sown as early in the spring as the soil can be prepared. As a consequence, oats should follow an intertilled crop, such as corn, that leaves the soil in a condition that permits early spring preparation. Corn ground that is disked and harrowed provides a good seedbed for oats. Oats are removed from the field early in the season. Thus, early harvesting permits early fall plowing in prepara-

[1] Cooperative investigations of the Crops Research Division, Agricultural Research Service, United States Department of Agriculture, and the agricultural experiment stations of Indiana, Illinois, Kentucky, Missouri, Oklahoma, Texas, Colorado, New Jersey, Virginia, Maryland, Ohio, Iowa, Arkansas, Kansas, and Nebraska.

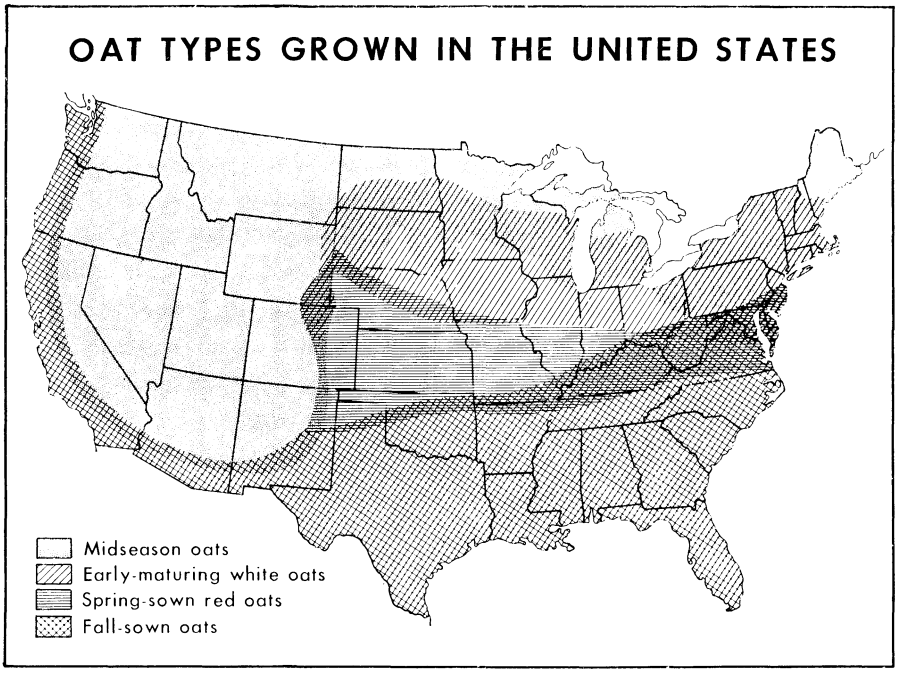


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*Figure 1.*—**General oat areas of the United States: In the southern and Pacific areas the crop is grown from both fall and spring seeding; in all other areas the crop is grown from spring seeding only.**

tion for wheat or other fall-sown crops that follow oats. In some areas, however, grass or a legume is sown with the oats.

In the northern part of the spring-sown red oat area the most popular rotation is corn 2 years, followed by oats, wheat, and clover each for 1 year. In such a rotation wheat is sown in the fall after oats, and clover is sown the following spring. If wheat is omitted from the rotation, oats serve as a companion crop for the clover sown with it. Sometimes soybeans are substituted for the wheat or for 1 year of corn.

Cotton is an important cash crop in lower southern areas where spring-sown red oats are grown. A popular rotation in that section consists of corn, sometimes with a legume seeded between the corn rows the first year, followed by oats the second year with soybeans or lespedeza probably sown in the oat stubble, and by cotton the third year.

## PREPARING THE SEEDBED

Oats respond well to good cultural methods. A moist, friable seedbed that is firm below and topped by 2 or 3 inches of mellow soil is favorable to oats. This preparation permits prompt germination, rapid plant growth, and good root development. Fields intended for oats are rarely plowed, as usually a satisfactory seedbed can be prepared by disking and harrowing. Plowing seldom gives a

sufficiently increased return to be profitable where oats follow a row crop such as corn, sorghum, cotton, or soybeans. Where the drill is to be used in seeding it usually is necessary to prepare the soil before seeding. Where oats are to be broadcast, the soil often is disked and harrowed only after the grain is sown.

## FERTILIZERS AND MANURES

Spring-sown red oats are grown over a wide area in which fertilizer requirements differ. The chief nutrient needed is nitrogen, but oats respond to additions of phosphorus and potash on some soils. Most soils in the areas where spring-sown red oats are grown generally contain sufficient nitrogen and potash for oat production and lime is seldom necessary. Oats make their greatest demand on soil nutrients during the early part of the season, when rather cool temperatures usually prevail. Nitrifying bacteria are rather inactive in cold soil, and readily available nitrogen can be supplied in fertilizers applied at seeding time.

Except on sandy soils or those extremely low in fertility, the application of barnyard manure usually is not advisable for oats. Application of barnyard manure may cause the crop to grow too rank and to lodge, and the rank growth may deplete the soil moisture. When manure is to be spread on a field on which oats are to be seeded, the application should be made during the fall or winter. More satisfactory returns from manure generally are obtained if the manure is applied to a previous crop in the rotation, such as corn.

Before 1945 little or no fertilizer was used in oat production in areas where spring-sown red oats are grown, except in the lower Southern and in the Eastern States. Experiments conducted in several sections, however, have shown a favorable response to fertilizer by oats, and the use of fertilizers is becoming more general. In the western part of the spring-sown red oat area, comprising the western parts of Kansas, Oklahoma, and Texas and eastern Colorado, commercial fertilizers are little used on any crop. The native fertility of the soil of this area is high, and moisture is usually the limiting factor in crop yields.

The farmer should contact his State agricultural experiment station to determine what fertilizer, if any, to use in his area. Local conditions determine whether fertilizers should or should not be applied for oats and, if so, the amount to apply. Fertilizers recommended for heavy clay and loam soils usually contain about 4 percent of nitrogen and 13 percent of phosphorus, applied at the rate of about 200 pounds per acre. If soils are very low in fertility, this rate can be doubled without injury to the crop. Increased yields frequently result on sandy and gravelly soils if 10 to 25 pounds of potash per acre is added to the above combination.

## PREPARING THE SEED FOR SOWING

### Screening and Fanning

Good practice for any grain crop dictates the sowing of clean seed, free from weeds. Oat seed usually is run through a fanning mill to screen out light oats, trash, and weed seeds. The removal of trash

facilitates operation of the drill or seeder. Lightweight oat kernels frequently are empty or do not germinate. Fanning the seed also removes some spores of smut and other seedborne diseases, thus decreasing infection to some extent.

## Seed Treatment [2]

It is advisable to treat seed oats with a good seed disinfectant before sowing. This prevents infection by the loose and covered smuts (fig. 2) and certain other seedborne fungi (fig. 3). Treatments may be applied as dusts, slurries, or liquids.

[2] Prepared by R. W. Leukel, pathologist, Crops Research Division, Agricultural Research Service.

### *CAUTION*

**Mercury fungicides are poisonous. Do not breathe in the dusts or the fumes from them. Do not let the chemicals come in contact with the skin, as they may cause blisters. Treat the seed in a well-ventilated place—never in a closed room. Do not use seed treated with mercury fungicides for feed or food.**

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*Figure* 2.—Smut of oats: Loose smut on left; covered smut on right.

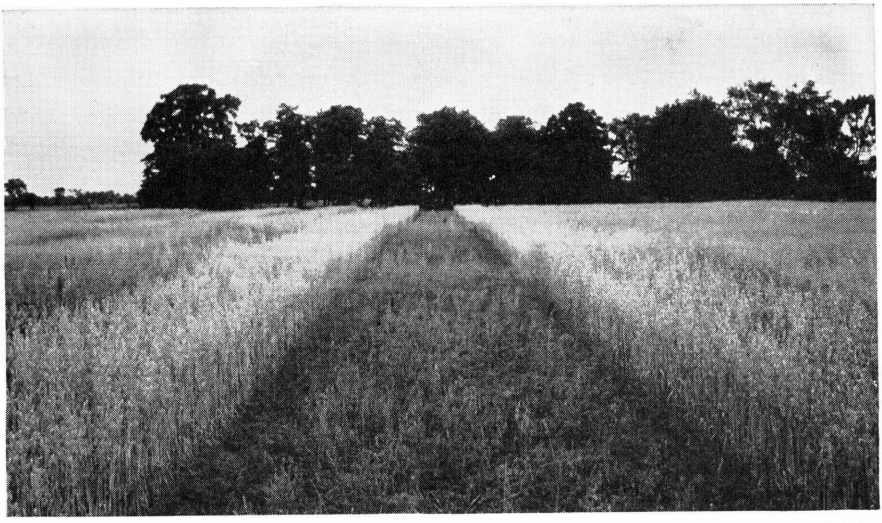

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**Figure 3.—Destruction of oats by Victoria blight in Ohio: Center variety was susceptible; those varieties to either side were resistant.**

### *Liquid Treatments*

In addition to the dust and slurry fungicides, several concentrated liquid fungicides are now available that may be applied to the seed by the so-called "quick-wet" method. These materials are very volatile. Therefore, they may be applied undiluted at rates ranging from ¼ ounce to 1 ounce per bushel. They may be applied undiluted in the "mist-type" ready-mix treaters, or they may be diluted with water and applied in slurry machines. Small amounts of seed may be treated in a homemade barrel-type mixer in the same manner as used in applying dust fungicides. The treated seed usually should be stored for 24 hours before sowing. Complete directions for applying these fungicides are given on the containers in which they are sold. These directions should be studied and followed carefully.

### *Dust or Slurry Treatments*

Three mercury fungicides are available in dust form for treating seed oats to prevent the oat smuts and some other seedborne diseases. They are Ceresan M, Agrox, and Puraseed.[3] The fungicides are applied at the rate of half an ounce per bushel, either as dusts or slurries, at least 24 hours before sowing. Complete directions for applying these fungicides are given on the containers in which they are sold.

The following liquid mercurials, suitable for treating seed oats, are now available: Ceresan 75, Ceresan 100, Ceresan 200, MEMA, Chipcote, Panogen 15, Panogen 42, Setrete, Mersol, Smut-B-Gon. The mercury content in the liquid fungicides ranges from about 1.5 to more than 7 percent.

Before the introduction of organic mercurial fungicides, formaldehyde was widely used for treating seed oats for the prevention of the oat smuts. It has several ad-

[3] Recommendation of these fungicides by the Department does not imply approval of these products to the exclusion of others that may also be suitable.

vantages over mercurial fungicides: It is cheaper, it is less hazardous to apply, and it does not render the oats unfit for feed. However, it frequently injures the seed and it does not protect oats against soil fungi.

Formaldehyde may be applied to oats as a spray, sprinkle, or dip.

The spray method: Mix 1 pint of formaldehyde with 1 pint of water and spray this over 50 bushels of seed at room temperature as the seed is being shoveled. Cover the seed for several hours and then sow immediately.

The sprinkle method: Mix 1 pint of formaldehyde with 10 to 30 gallons of water at about 70° F. and sprinkle it over 50 bushels of seed as it is being shoveled over on a clean floor. Cover the seed for several hours and then sow.

The dip method: Mix 1 pint of formaldehyde with 40 gallons of water in a barrel or tank. Dip loosely filled burlap sacks of oats in this solution until the grain is thoroughly wet. Drain the seed, spread it out to dry at room temperature for several hours, and then sow.

### Certified Seed

The additional cost for good seed usually is a small item in the total expense of growing an oat crop, yet the importance of good seed is often overlooked. Certified seed should be sown if it can be obtained, especially when new disease-resistant varieties are being grown for the first time in a locality. The sowing of certified seed of a new variety will provide a source of supply of pure seed of the variety for neighbors the next year.

For sources of seed and information as to varieties recommended, the grower should consult his local county agricultural adviser or write to his State crop improvement association, State extension service, or State agricultural experiment station.

## SOWING THE CROP

### Seeding Methods

Oats are sown either by broadcasting or with a drill. The drill is preferable, because it places the seed at a more even depth in the soil and covers it more uniformly. Drilling usually places the seed in moist soil where conditions for germination are favorable. Drilling may also reduce damage from soil blowing.

Broadcasting the seed frequently permits more rapid and earlier seeding. Early seeding is especially important in those areas where spring-sown red oats are grown, and sometimes even a short delay in seeding adversely affects the crop yield. Disking or harrowing covers most of the seed that is broadcast. However, disking or harrowing leaves some of the seed uncovered and may bury other seed so deep that emergence is slow and uneven.

### Seeding Rates

The seeding rate for spring-sown red oats varies with locality, condition of the soil, seeding method, and variety. Higher rates are sown on weedy land or where the seed is broadcast. About one-fourth less seed is needed when oats are drilled. When the large-seeded varieties are sown, heavier seeding rates are sometimes recommended.

Numerous experiments on rates of seeding have been conducted at different locations where spring-sown red oats are grown. Additional tillering of the plants tends

to compensate for thin stands. Most of the spring-sown red oats are sown at rates ranging from 6 to 12 pecks per acre. The lower rates are sown in areas of low rainfall. The seeding rates for large-kerneled varieties usually are from 1 to 2 pecks greater than for those with smaller seeds.

### Seeding Dates

Early seeding is highly essential for good yields of spring-sown red oats. Spring-sown oats generally withstand some cold weather. Frequently the loss from sowing late is greater than that from freezing following seeding that is too early. Varieties differ, however, in their ability to withstand cold weather immediately following seeding. The county agricultural adviser should be consulted in the matter.

In northern Texas, Oklahoma, and Arkansas and in southern Missouri, oats sometimes can be sown as early as late January or February. Farther north seeding is somewhat later, but even in these areas the spring sowing of red oats should be done by March 15 or as soon thereafter as possible.

## CONTROL OF WEEDS IN THE GROWING CROP

The use of chemical weedkillers on oatfields has not yet proved popular or entirely satisfactory. Oats are injured by most chemicals more easily than is wheat or barley. MCPA is less injurious to oats than is 2,4–D. The best time to spray oats is after the plants reach a height of 6 to 8 inches and before the jointing stage.

BN–5034

*Figure 4.*—Harvesting standing oats with a combine in Kansas.

## Combining

The combine (fig. 4) is the usual machine for harvesting oats in most spring-sown red oat areas. Oats sometimes are windrowed and picked up by the combine (figs. 5 and 6) if the fields are weedy or not uniform in ripening. Windrowing also permits the seed to dry thoroughly prior to threshing and reduces losses in stored grain. Oats may be harvested with a binder (fig. 7) where the fields are small or where all of the straw is desired as roughage for livestock. Oat straw usually is superior in nutritive value to that of any other small grain. Oats sometimes are cut with the mower when they are badly lodged or are extremely short because of heat and drought injury.

Oats should be cut with the binder shortly after they reach the hard-dough stage to avoid losses from shattering and breaking of straw. When the combine is used, the oats should be allowed to stand until fully ripe. When fully ripe, the grain can be stored without danger of loss from heating or molding in the bin. Oats are windrowed before the crop is fully dry. Oats can remain in the windrows a week or 10 days without much risk of loss of grain. The grain is then threshed by a combine fitted with a pickup attachment. Windrowing allows green weeds to dry out before threshing and thus reduces the problem caused by weed refuse in the grain.

## Shocking

Fewer oats are now cut with the binder than formerly. Some oats are bound when the crop is a little green because the straw is desired as a roughage for livestock. Such immature bundles are set in small open shocks or in long shocks. If capped properly, long shocks are protected from rain almost as well as are round shocks.

Round shocks usually stand better in windstorms and offer more

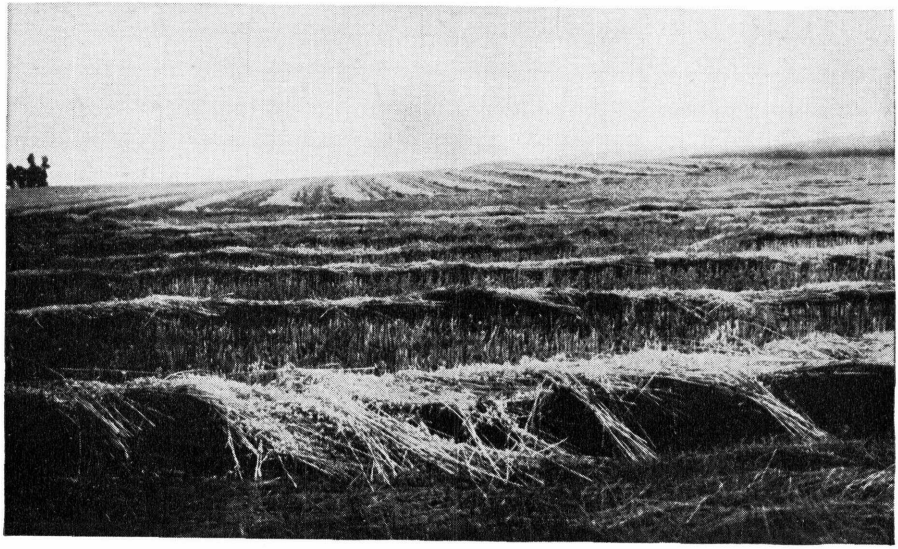

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*Figure 5.*—**Oats cut and windrowed preparatory to combine threshing.**

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*Figure 6.*—**Self-propelled combine used in threshing windrowed oats.**

BN–5036

*Figure 7.*—**Cutting oats with the binder.**

protection from the weather, as less surface is exposed. The shocks seldom are capped where high winds are prevalent, because the cap bundles, which are blown off easily, may be damaged. In starting either the round or long shock, set the first 2 bundles with flat sides adjacent. Place the butt ends a few inches apart solidly in contact with the soil and push the tops firmly together. In the round shock set additional bundles adjacent to the original pair and place other bundles in the partial gaps between bundles to form a well-rounded ex-

terior. Most shocks contain 10 to 12 bundles. Large shocks dry more slowly but stand up better. Cap the round shock with 1 or 2 bundles laid in the direction of prevailing winds. Divide the butt ends of the cap bundles so that the 2 ends are astride the shock.

Set long shocks in the direction of prevailing winds. Set these shocks with 4 to 6 pairs of adjacent bundles; sometimes it may be necessary to place additional bundles along each side to support the shock. Cap bundles also may be placed on long shocks.

### Stacking

Stacking often is advisable when a legume is seeded with the oats. Stacks should be built either on a high spot with good drainage or on a base of poles or rails laid on the ground. The stacks usually are round.

The stack is built by setting up a round shock and then adding bundles by placing each row a little flatter, butts outward, until the desired basal area of the stack is attained. When the stack reaches a height of 8 feet, the diameter of the stack is gradually reduced by laying each outer layer of bundles with the short side uppermost. Thus, the stack is gradually sloped up to a point so that it will shed water.

It is very important to keep the center of the stack well filled, tramped solid, and higher than the outer rim. To accomplish this, let each successive row overlap the previous row a little more as stacking progresses toward the center. Some bundles in the inner rows of each layer may be placed with heads outward. The peak bundles of the stack are put on as in capping a shock. Sharpened stakes 6 to 8 feet long may be driven through top bundles down into the center of the stack, or weighted wires may be hung over the top of the stack, to keep the top bundles in place.

## OATS FOR HAY

Oats sometimes are cut for hay, especially when hot, dry weather injures the filling of the grain. Oats intended for hay are cut in the soft-dough stage. When cut at this stage and properly cured, oats make a very palatable and highly nutritious feed much relished by livestock. Oat hay is handled in the same manner as is other grass hay.

## OATS FOR SILAGE

The use of oats for silage appears to be on the increase. Oats cut for silage may often be more profitable than when combined for grain. Oat silage makes an excellent feed for cattle, especially dairy cows. Oat silage is available much earlier in the season than is corn or sorghum silage, and can be used as supplemental feed during the late summer months when pastures often are short. The most favorable time to cut oats for silage is when the kernels are in the soft-dough stage and before leaves begin to dry up. Cutting oats for silage has the added advantage of removing the crop from the soil about 2 weeks earlier than by combining, which enables lespedeza, clover, or alfalfa to make a more rapid growth and become better established before summer heat becomes excessive. The better growth of the legume may provide additional summer grazing for livestock or may even permit the cutting of a hay crop. Oats for silage are cut with a forage harvester (fig. 8).

BN–5037

*Figure 8.*—**Harvesting oats for silage.**

## VARIETIES ADAPTED IN THE AREA

In general, oats of two types are grown in the United States—the so-called white oats, usually classed as belonging to *Avena sativa*, and the red oats, usually classed as belonging to *Avena byzantina* C. Koch, which was derived from the wild red oat (*Avena sterilis* L.) of the Mediterranean region. As a consequence, in the sense commonly used, "white" and "red" do not apply to the specific color of the lemma but in general to their derivation, for oats of widely differing lemma colors are included in each of the two categories. Formerly red oats were considered especially adapted to warm climates, largely because they were supposed to have more ability than white oats to withstand heat during the critical heading and filling stages. It now seems, however, that the earliness of some red oat varieties is more likely the characteristic that often enables them to escape injury from hot weather, drought, and even rust.

Numerous crosses between oats of these two types have resulted in the production of varieties somewhat intermediate between them. Specific mention of this fact is made in this bulletin in discussing the varieties.

### Alamo

Alamo is very early with short, stiff straw and erect early growth. The panicles, or inflorescence, are of medium size and erect. The kernels are reddish yellow to red, short, and plump with few to no awns or basal hairs. It is susceptible to Victoria blight but is resistant to many races of smut. Alamo is the first variety distributed in the southern United States with combined high resistance to most prevalent races of both crown and stem rust. It is resistant to all races of stem rust except race 7A.

Alamo was derived from the cross (Victoria × Hajira-Banner) × (Fulghum-Victoria) made at the Iowa Agricultural Experiment Station, Ames, in 1940–41. Seed of the cross was sent to Denton, Tex., in 1941, and the strain

eventually named Alamo was selected in 1946 at the Texas Agricultural Experiment Station, Substation No. 6, Denton.

Seed of the variety was released in 1953, and Alamo has become one of the most promising of the new oats for fall seeding in the lower southern winter oat area and for spring seeding in northern Texas. It has not produced satisfactorily when spring sown in areas farther north.

## Andrew

Andrew has rather stiff midtall straw, is early, and has yellow to reddish-yellow kernels and rather large panicles that sometimes are recurved at their tip when mature. Andrew is actually a yellow oat, although in derivation and plant characters such as earliness and length of outer glumes, it is similar to spring-sown red oat types. The kernels are long, midplump, thin hulled, with relatively few awns or basal hairs. The variety is resistant to the prevalent races of smut, to stem rust races 7 and 7A, to some races of crown rust, and to Victoria blight.

Andrew was derived from the cross Bond × Rainbow made in 1933, at the Minnesota Agricultural Experiment Station, St. Paul. The final selection was made in 1942 and the variety was released to farmers of Minnesota in 1949. The Bond parent is a red oat, derived from a Red Algerian × Golden Rain oat cross made in Australia. Andrew became popular as a replacement for the previously grown Victoria derivatives when they succumbed to Victoria blight. Andrew is now grown in many areas of the spring-sown red oat area, especially in the more Eastern States—Kentucky, Maryland, and Virginia.

## Brunker

Brunker is an early red oat with midtall, slender, weak straw that is slightly hairy at the nodes, or joints. The leaf margins usually are hairy on the lower third. The panicles are small with spreading or somewhat drooping branches and the top of the panicle usually is slightly recurved at maturity. The kernels are midlong, rather slender, with rather distinct striping on the hulls and a few awns or hairs at the base.

Brunker was selected at the Central Great Plains Field Station at Akron, Colo., in 1919 from material that had been selected from a field of Burt in Tennessee. It was first distributed in Colorado in 1929 and has been a popular variety in dryland areas of eastern Colorado and adjacent areas of adjoining States for more than 25 years. Brunker is highly resistant to many smut races.

## Burt

Burt was apparently the first notable selection made from Red Rustproof. It was selected by a Mr. Burt of Greene County, Ala., in 1878. It was once an important spring-sown red oat. Burt is the most variable oat variety ever grown extensively in this country, and it contains red, yellow, white, gray, and black kernels, and numerous forms of kernel bases and degrees of hairiness. It differs from Fulghum in being earlier and in having longer but more slender kernels and fewer awns. Burt has been called Early Ripe, Early Bird, Early Harvest, Gamlin, Little Red Rustproof, Early Six Weeks, May, June, Fourth of July, Ninety Day, Burt's Extra Early, and possibly other names. The original variety apparently is no longer cultivated, but four varieties were later selected from Burt. Some selected strains of Burt are somewhat resistant to certain races of stem rust, others to certain races of crown rust, and many are rather highly resistant to some smut races.

## Cherokee

Cherokee is a short to midtall, very stiff-strawed, early oat with equilateral panicles and rather short, very plump, thin-hulled, mostly awnless kernels. The kernels are rather reddish or pinkish gray. Climatic conditions greatly affect the development of its kernel color. This oat is resistant to Victoria blight, to most races of smut, and to many crown and stem rust races. Unfortunately, it is susceptible to some of the most prevalent crown rust races and to stem rust races 7 and 7A.

The Cherokee oat was selected at the Iowa Agricultural Experiment Station, Ames, in 1936, from a cross, D69 (Richland × Green Russian) × Bond, made at Ames in 1932. Several State experiment stations assisted in the subsequent testing of the variety, which was distributed in Kansas in 1948 and in Nebraska in 1949. Cherokee has become one of

the most widely grown varieties in these States as well as in the southern part of the Corn Belt where spring-sown red oats are the preferred type.

## Cimarron

Cimarron is an extremely early, short-strawed, winter-hardy oat with semierect leaves characterized by being somewhat blunt at the apex. The kernels are small to midsized, rather plump, usually awnless, and range from almost white through yellowish gray to gray. The development of darker colors is influenced by environmental conditions. The variety has given good results both from fall and spring seeding in Oklahoma, outyielding Kanota in spring-sown experiments. Cimarron apparently lacks disease resistance.

Cimarron resulted from a mass selection of plants of several oat varieties that survived the winter of 1934–35 at the Southern Great Plains Field Station, Woodward, Okla. Reselection from this bulk progeny in 1946 produced the Cimarron variety. It was tested and released by the Oklahoma Agricultural Experiment Station, Stillwater. Seed was distributed to Oklahoma farmers in 1954. The oat is used for both fall and spring seeding.

## Colburt

Colburt is a short, slender-strawed, small-panicled, very early variety, with plump, black, usually awnless kernels. The hulls usually are more glaucous (a waxy appearance or a "bloom") than those of other black-kerneled varieties. The tip of the lemma usually is light colored. It was selected from Burt at the Central Great Plains Field Station at Akron, Colo., in 1911. The oat was once grown to a limited extent in eastern Colorado and adjacent areas in adjoining States. Unlike most Burt strains it is highly susceptible to many races of oat smut.

## Columbia

Columbia has erect early growth and tall, rather slender, weak straw, but it resists lodging. The stems usually lack hairs at the nodes, but the leaves and leaf sheaths are sometimes slightly hairy. The panicles are erect and medium to large, with somewhat drooping branches and the panicle tips are often slightly recurved at maturity. The kernels are of medium size and gray to brownish gray in color, with rather conspicuous, light-colored nerves or veins. Basal hairs and awns are few or absent. It is resistant to certain races of smut.

Columbia, originated as an offtype in Fulghum, was selected at the Missouri Agricultural Experiment Station, Columbia, in 1920. It was first distributed to farmers in 1930, and by 1941 it occupied more than 85 percent of the oat acreage of Missouri. Comparatively large acreages also were grown in Arkansas, Illinois, Indiana, Iowa, eastern Kansas, Kentucky, Maryland, Missouri, Nebraska, Ohio, and Oklahoma. It still is grown in some areas.

## Dupree

Dupree is an early maturing, short-strawed, vigorous-growing, yellow-kerneled oat derived from crossing a strain from the cross Bond × Anthony with a derivative from a Fulghum × Richland cross. The variety yields rather well, but it is inclined to have weak straw and the test weight usually is below that of many other early oats. The cross and the selection were made at the Kansas Agricultural Experiment Station, Manhattan, and the oat was named and distributed in South Dakota in 1954.

## Early Red Rustproof

This selection from Red Rustproof is earlier and taller than the parent variety. The young plants are erect. The stems are midtall, rather stiff, and have no hairs on the nodes and the leaves are dark green with a few hairs. The panicles are small with somewhat drooping branches and with tips often recurved at maturity. The kernels are more slender than those of typical Red Rustproof, but otherwise they are similar. It has considerable resistance to smut and is a distinct spring type. Early Red Rustproof was selected at the Kansas Agricultural Experiment Station at Manhattan in 1918 and was distributed by the Nebraska Agricultural Experiment Station, Lincoln.

## Ferguson No. 71 and Ferguson No. 922

Ferguson No. 71 was selected from Red Rustproof in 1906 by A. M. Ferguson, a

pioneer commercial oat breeder then living at Sherman, in northern Texas. It has all the characters of the Red Rustproof variety, described on page 18, except it is more uniform. A reselection, Ferguson No. 922, was made by the same breeder about 1916. Ferguson No. 71 was released in 1916 and Ferguson No. 922 some 10 years later. Both were grown from fall and spring seeding in northern Texas and adjacent areas of adjoining States. Since more disease-resistant red oats for spring seeding have become available, these strains have become of less importance than formerly.

## Franklin

Franklin is slightly later and more susceptible to smut than Fulghum, from which it was selected. It also has more erect early growth, taller, stiffer straw, fewer awns, shorter and plumper kernels, and is more uniform than Fulghum.

Franklin was selected from Fulghum by the Department of Farm Crops, Ohio State University, Columbus, in 1922. It was released in 1931 and was grown in Ohio, Illinois, and Indiana, but has since been largely replaced by varieties that are more disease resistant.

## Fulghum

Fulghum is one of the most important oat varieties ever developed in North America. It originated in southeastern Georgia before 1900 as a selection made by J. A. Fulghum, a farmer, from his field of Red Rustproof oats. He noted the early maturity of the original plant and increased its seed in his garden. The value of Fulghum as a spring-sown oat was established in Kansas about 20 years later. One strain of Fulghum, named Kanota, was released to Kansas farmers in 1919. Kanota soon spread across a belt extending from eastern Colorado to New Jersey and also became a leading oat in California. Other strains, Frazier, King, and Coker Fulghum No. 4, differ from the common Fulghum by minor plant or kernel characters and never were as widely grown as Kanota.

The kernels of Fulghum are a reddish buff. The inner hull often is flecked with gray and the outer chaff is not so long or coarse as that of Red Rustproof. They have fewer awns than Red Rustproof, usually do not have the large "sucker mouth," and have fewer hairs at the base of the kernel than those of Red Rustproof. Although thousands of selections have been made from Fulghum, few pure breeding lines have ever been obtained. Some Fulghum-type oats are still grown in the Oklahoma, Kansas, Missouri, and Kentucky area, but more disease-resistant varieties, many of which were derived from crosses with Fulghum, have now very largely supplanted the original strains of the variety.

Fulghum oats are characterized by occasional reversions to offtypes, including fatuoid, or "false wild," kernels. The offtypes may differ also in being earlier, more erect in early growth stages, or in having slightly more slender kernels or lighter colored or even gray or black kernels.

## Fultex

Fultex is a short, stiff-strawed, early-maturing variety that is rather erect in early stages of growth. The stems are slender and the panicles are rather short and erect. The kernels are reddish to grayish red, rather short, plump with rather prominent nerves or veins in the lemma, or back of the kernel, giving the kernels a grayish, striped appearance. Awns frequently are present but basal hairs usually are few or absent. Fultex has considerable winter resistance, being superior to Red Rustproof and Fulghum in that respect, and is often fall-seeded in Texas. It is resistant to many races of smut and to crown rust, but it is susceptible to Victoria blight and to all races of stem rust.

Fultex was derived from a cross made in 1930 at the Arlington Farm, Rosslyn, Va. Bulk $F_3$ generation progenies from rust-resistant plants were sent to Texas Substation No. 6, Denton, in 1932, and Fultex was selected at that station in 1933. It was increased and released to farmers in north-central Texas in 1940. This early-maturing variety has been much used for spring seeding in the northern Texas area and to a lesser extent in southern Oklahoma.

## Fulton

Fulton is very early with midtall, rather weak straw. The panicles are of medium size and erect, but slightly drooping or recurved at the top at maturity and with rather short, usually

drooping side branches. The reddish-yellow to grayish kernels are slender to midplump. The few awns present usually are straight. Fulton is one of the earliest maturing of all spring-sown red oat varieties. The variety originated from a Fulghum × Markton cross, made at Aberdeen, Idaho, in 1926. Selected panicles, sent to the Kansas Agricultural Experiment Station, Manhattan, in 1928, included the strain eventually named Fulton. It was released to farmers of Kansas in 1939. Fulton is highly resistant to many races of smut and to Victoria blight, but it is susceptible to crown and stem rusts.

The variety became popular in Kansas and has been grown to some extent in Missouri, Colorado, Nebraska, and Oklahoma.

## Minhafer

Minhafer is a high-yielding, early-maturing oat of medium height, with unusually stiff straw. The kernels are yellow, plump, and comparatively free from awns. It was resistant to all races of crown rust, stem rust, and smut prevalent in North America at the time of its release in 1957.

The Minnesota Agricultural Experiment Station developed this variety from the cross (Bond-Rainbow × Hajira-Joanette) × Landhafer.

## Mo. O–200

Mo. O–200 is similar to Columbia in many characteristics. The plants are light green, tall, and vigorous, with wide-spreading panicles. The kernels are shorter and more plump than those of Columbia, light red, and striped on the back. The variety has some smut resistance and is resistant to stem rust race 7 and to Victoria blight, but it is susceptible to prevalent races of crown rust.

Mo. O–200 was derived from a cross, Columbia × (Bond-Iogold), made in 1936 by the late B. M. King at the Missouri Agricultural Experiment Station, Columbia. The selection, later designated Mo. O–200, was made at Columbia in 1941. The variety was released for growing on farms in Missouri, but it has been largely supplanted by Mo. O–205, a better adapted variety released in 1951.

## Mo. O–205

Mo. O–205 is tall, vigorous, and productive, and it also is similar to Columbia. The panicles are spreading and the plants are light green. The straw is slender, but the plants resist lodging because of a strong, vigorous root system. The medium-sized gray kernels are distinctly striped by lighter colored veins. The hulls are thin and the groat percentage is relatively high. The variety is moderately resistant or tolerant to most prevalent races of crown rust and to stem rust races 2, 5, 7, and 7A. It has been resistant to most prevalent races of smut and is resistant to Victoria blight.

Mo. O–205 is a selection from a cross, Columbia × (Victoria-Richland), made in 1936 by the late B. M. King of the Missouri Agricultural Experiment Station. The selection, eventually named Mo. O–205, was made at that station in 1940. The oat was released to farmers in Missouri in 1951 and has become unusually popular throughout the spring-sown area, being among the most widely grown of any of present-day varieties. The rather small grains are unpopular on the market.

## Mustang

Mustang is a hardy fall-sown variety that sometimes is spring sown, usually in February, in northern Texas and southern Oklahoma. It has a rather short, stiff straw and is earlier than either Nortex or Ferguson No. 922. The plants are upright in early growth and have medium, slender stems and spreading panicles. The kernels are medium sized and usually reddish gray, but are somewhat variable in color with rather definite lighter colored veins on the back. Awns frequently are present and usually are straight. A few hairs may appear at the base of the kernels. Mustang is resistant to many races of smut and crown rust and appears to be somewhat more tolerant to Victoria blight than are some of the other Victoria derivatives. It is not resistant to stem rust.

The variety is a selection from a cross, (Lee-Victoria) × Fulwin, made at Aberdeen, Idaho, in 1937. Seed of a group of selections found to be crown rust resistant in greenhouse tests at Arlington Farm, Rosslyn, Va., was distributed to several stations in 1942. The strain eventually named Mustang is a reselection made at the Texas Substation No. 6, Denton. It was first distributed to farmers in Texas in 1950.

## Nemaha

Nemaha is very similar to Cherokee, although it was derived from different parents. They apparently have the same reaction to oat diseases.

Nemaha was derived from the cross, (Victoria-Richland) × (Morota-Bond), made at the Iowa Agricultural Experiment Station, Ames, in 1936 where the strain subsequently named Nemaha was selected in 1940. After the strain had been widely tested in the Corn Belt and Southwest, it was released simultaneously by the Nebraska, Kansas, and Iowa stations in 1948. The variety is now less popular than formerly.

## Neosho

Neosho is characterized by early growth and slender, short, very stiff straw. It has wide leaves and medium to large panicles. The panicle branches usually are somewhat elevated and kernels are red to reddish gray, short, wide, plump, with more or less distinctly marked backs or lemmas. Awns are common, and basal hairs frequently are present. Neosho is resistant to many races of smut, as well as to most prevalent races of crown and stem rust. However, its susceptibility to Victoria blight has made it less popular than formerly.

Neosho originated as a selection from a cross, (Fulghum-Markton) × (Victoria-Richland), made at Aberdeen, Idaho, in 1935. The selection eventually named Neosho was selected at the Kansas Agricultural Experiment Station, Manhattan. The variety was distributed for growing on farms in Kansas in 1945 and still is grown on limited acreages in western Kansas and in Oklahoma.

## New Nortex

New Nortex is a selection from the Appler strain of Red Rustproof. It was developed at the Denton, Tex., station and was distributed in 1940. It is slightly later and more productive than Nortex and has largely supplanted that variety in Texas, where it is grown both from fall and spring seeding.

## Nortex

Nortex differs from Red Rustproof, from which it was selected, primarily in being more uniform, in being slightly earlier and slightly more winter resistant, in having somewhat stiffer straw, and in producing higher yields.

The variety originated as a pure line selection made in 1914 by the Texas Agricultural Experiment Station, Substation No. 6, at Denton. It was first distributed in 1926 and probably is one of the most uniform and productive strains of Red Rustproof. It has been widely grown from both fall and spring seeding, especially in Texas and Oklahoma and to a lesser extent throughout the South.

## Osage

Osage is early, short strawed, rather profusely tillering, and has rather short, slightly drooping panicles. The kernels are yellow to yellowish red, somewhat slender, seldom awned, and with little pubescence. The variety is resistant to most prevalent races of crown rust, stem rust races 7 and 7A, and most smut races. It is extremely susceptible to Victoria blight.

Osage was selected from a cross, Fulton × (Victoria-Richland), made at Aberdeen, Idaho, in 1935. Selections were made in Idaho, Iowa, and Kansas, and testing for disease resistance was done in the greenhouse at Arlington Farm, Rosslyn, Va. Osage was distributed by the Kansas Agricultural Experiment Station in 1946 and later was grown to some extent in several adjacent States. It still is grown to some extent in the dryland areas of western Kansas where Victoria blight is not prevalent.

## Otoe

Otoe was selected from Burt, but is more uniform than Burt, slightly superior in drought resistance, and is resistant to certain races of stem rust.

It was selected at the Nebraska Agricultural Experiment Station, Lincoln, in 1920. It was distributed to farmers in Nebraska in 1941, where it is grown to a limited extent in the western part of the State.

## Red Rustproof

Nearly all red oat varieties now spring sown in this country trace back to the Red Rustproof variety or its derivatives, Fulghum and Burt (fig. 9). Red Rustproof oats were first grown in this country by Spanish padres who probably brought them from Spain to Mexico and

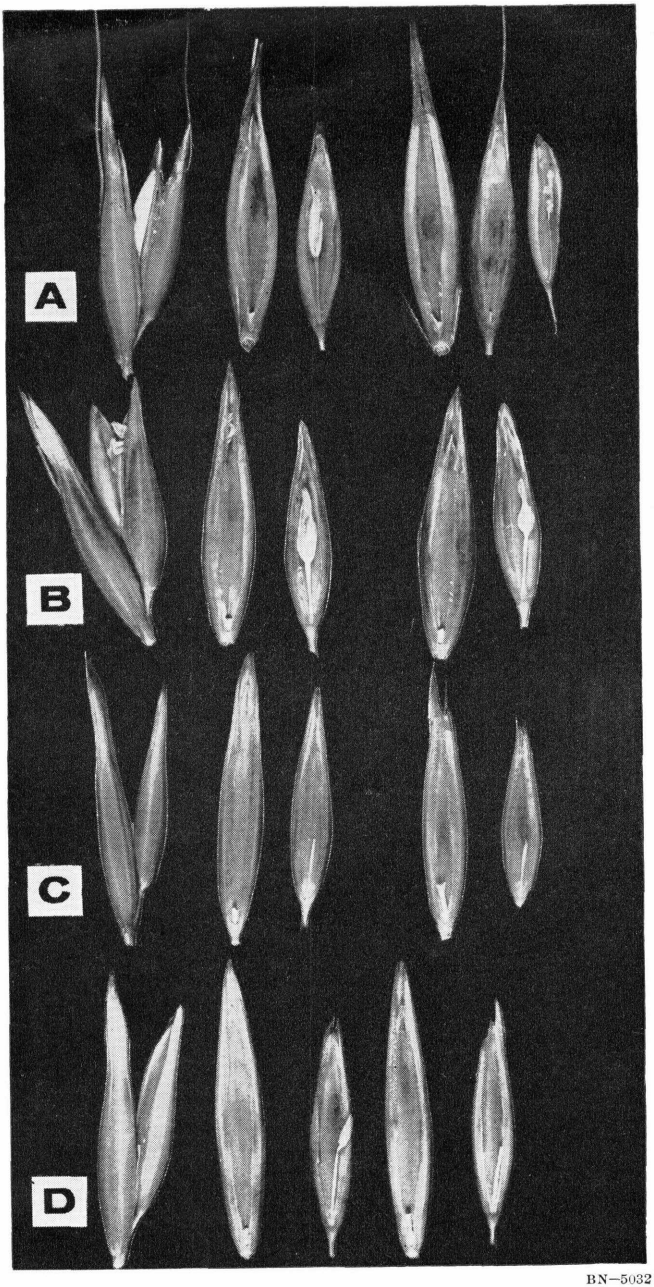


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*Figure 9.*—Kernels of red oat varieties: *A*, Red Rustproof; *B*, Fulghum; *C*, Columbia; and *D*, Brunker.

the Southwestern United States. Red Rustproof oats are similar to the Algerian, a variety that is still grown in the Mediterranean region. Oats of this type were grown in California before 1800 and in Georgia since about 1850.

Red Rustproof oats are not actually resistant to either crown or stem rust, but rust usually does not develop on them until rather late in the growing season.

Numerous names have been applied to Red Rustproof and its various strains. Among these names are Texas Red, Red Texas (Texas Red Rustproof), Alabama Red Rustproof, California Red, Appler, Hastings Hundred Bushel, Cliff, Cook, Damier, McGehee, Patterson Red Rustproof, Bancroft, Mercier, Baylis, Ferguson No. 71, Ferguson No. 922, and others.

The straw of the Red Rustproof oat is of medium height and strength and often has a reddish color. The panicles are small to midsized, often rather recurved or drooping at the top when mature, with rather long drooping branches. The kernels are large, plump, and reddish brown, with rather long, coarse outer glumes. Both kernels of the spikelet usually bear rather straight awns and a tuft of long hairs at the base of the kernel. The paired kernels are inclined to hang together after threshing. Red Rustproof is midseason to late in maturity and usually relatively free from smut.

Formerly Red Rustproof oats were widely grown from spring seeding but have now been largely replaced by earlier, better adapted varieties except in the southern margin of the spring oat region. There they often are sown in late January or in February. A few varieties that were selected from Red Rustproof are still being grown.

## Trojan

Trojan has short, fine, yet very stiff straw, is early maturing, and has a very slender white, usually awnless, kernel. It is resistant to some races of smut.

It was selected from Burt at the Central Great Plains Field Station at Akron, Colo., in 1921. Trojan was distributed in eastern Colorado and grown to some extent in adjacent areas of Nebraska and in South Dakota.

## Victorgrain 48–93

This variety is medium early and high yielding, with short, stiff straw, and erect panicles with somewhat drooping side branches. It is awnless and has plump reddish kernels with short hairs on the rachilla. It is resistant to certain races of crown rust and smut but is susceptible to Victoria blight and to all races of stem rust.

Victorgrain 48–93 was reselected in 1946 from an older strain of Victorgrain by the late George J. Wilds of the Coker Pedigreed Seed Co., Hartsville, S. C. The older Victorgrain was derived from a Victoria × Fulgrain cross. Victorgrain 48–93 was first distributed in 1950. Although primarily an oat intended for fall seeding, it frequently is spring sown, usually in February, in the more eastern areas of the spring-sown red oat region.



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